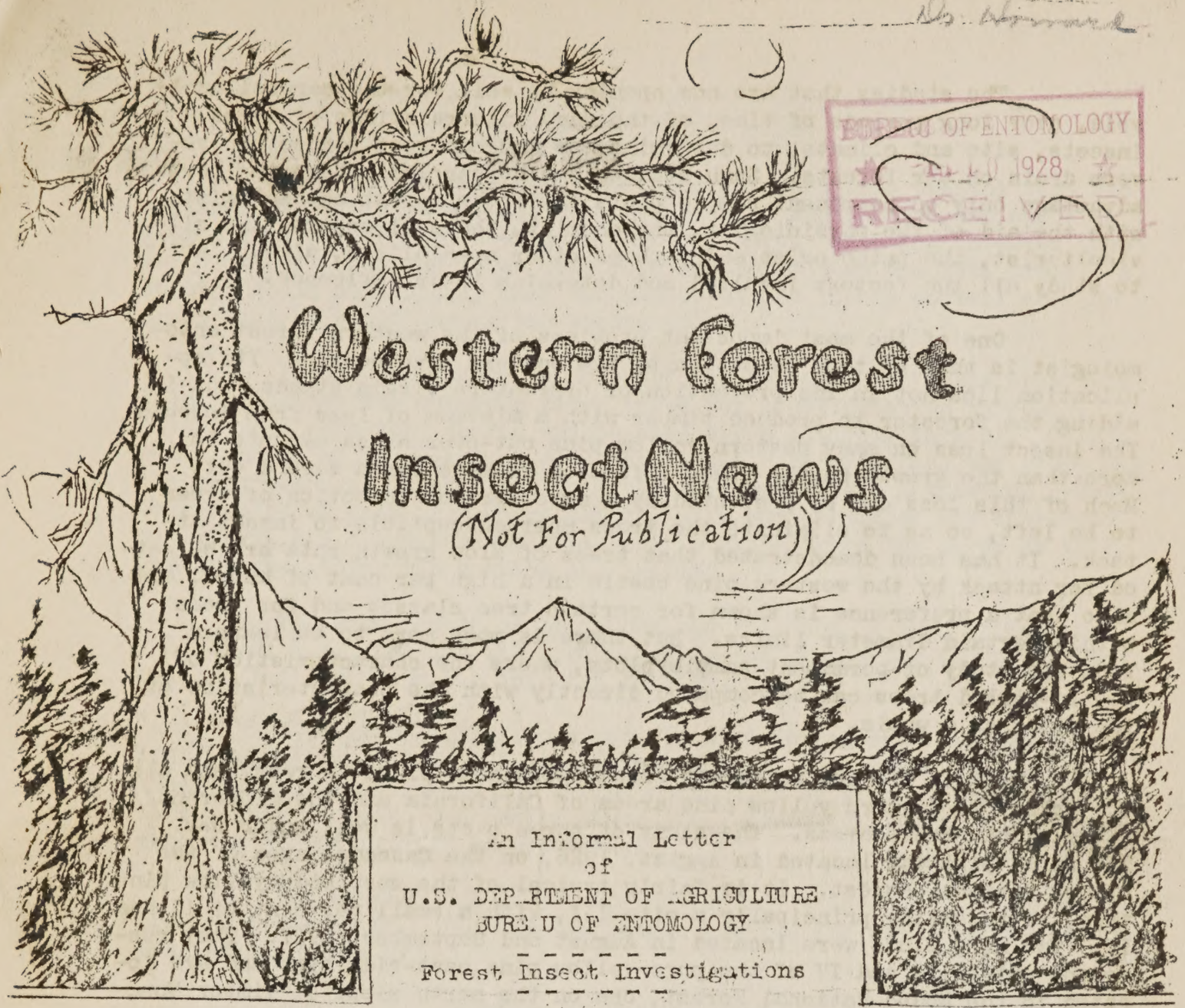

An Informal Letter
of
U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY
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Forest Insect Investigations
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423 Jordan Hall, Stanford University, Calif., February 1, 1928

THE USE OF PERMANENT SAMPLE PLOTS IN WESTERN PINE BEETLE STUDIES

by Hubert L. Person

The selection of an 80-acre sample plot in 1926 and the addition of two 40-acre plots in 1927 may be taken as one mark of the change in the nature of forest insect investigations that has taken place within a short space of time. Much of the cream of discovery has been skimmed off the field of forest entomology, and the day of short-time studies on a great variety of insects, and of promiscuous wanderings through the forests for the taking of notes on life histories and habits of miscellaneous insects, has largely passed for the scientific investigator. There is still much to be gained by this type of study, but by most of us it will have to be followed as a side line or as a form of recreation. The more evident habits and points in the life histories of our most injurious forest insects are known. What is most needed now is a knowledge of the fundamental relationships that result in increases or decreases in the loss from insects.

The studies that are now opening up call for the careful analysis, over long periods of time, of the many interrelations of trees, insects, site and climate, to determine how man can best reduce the severe drain on our forests. Such studies can be carried out to the best advantage only on permanent sample plots where the forest entomologist, with the aid of the physiologist, the chemist, the soil expert, the silviculturist, the pathologist and perhaps other specialists, will be able to study all the factors involved and determine their influence.

One of the most important problems of the western forest entomologist is that of tree selection by the western pine beetle. Its application lies not in the protection of overmature virgin stands, but in aiding the forester to produce timber with a minimum of loss from insects. The insect loss on many western yellow pine cut-over areas amounts to more than the growth on the trees left as a reserve for a second cut. Much of this loss can be prevented by a more careful selection of trees to be left, so as to eliminate the trees most susceptible to insect attack. It has been demonstrated that trees of slow growth rate are selected for attack by the western pine beetle in a high per cent of cases, and also that a preference is shown for certain tree classes and for trees within certain diameter limits. But there is much more to be learned from the study of permanent sample plots, where the characteristics of beetle-killed trees can be compared directly with the characteristics of the stand as a whole.

It is planned to locate enough permanent plots to represent all the principal western yellow pine areas of California and the different sites within these areas. The study of three plots is well under way. The first plot was located in August, 1926, on the Cascadel area of the Sierra National Forest. It is fairly typical of the west side yellow pine type, representing principally a site III, with a small per cent of II and IV. Two more plots were located in August and September, 1927. They represent sites III and IV of the pure yellow pine east-side type and are located in the Modoc National Forest, one on the north slope of Timber Mountain and the other near Brown's Well. The Cascadel plot represents areas with moderately low insect losses, while the Modoc plots are examples of the most severe epidemic conditions.

The boundaries of all three plots are permanently marked, and each plot is mapped so as to show the exact location of every yellow pine over 10 inches in diameter, reproduction and brush cover by groups, topographic features and landmarks. Each tree is marked with a numbered metal tag. On a card with the same number is recorded the diameter, height, tree class (according to Dunning's new tree classification), shape, length and width of crown, elevation, exposure and slope, and noticeable injury or any peculiarity. An increment core is taken from each tree whose measurements are taken, of each of the last ten rings and the number of rings to the last half-inch.

It is hoped that a long-time study of these plots, supplemented by less intensively studied temporary strip plots and sample sections such as Keen has been using, will do much to determine the relative susceptibility of different stands and the individuals of any stand, as well as many other points which can be applied to the reduction of forest insect losses in western yellow pine.

FALL CONTROL COSTS MORE THAN SPRING CONTROL ON COLORADO NATIONAL FOREST

Work in the fall costs 30 cents more per tree treated than the spring work. This is all due to the fact that supervision and spotting were slightly more than double in the fall work. Locating infested trees was difficult, and the trees were more scattered than the 1926 trees. A spotter could handle only half the number of men in his control crew or crews that he could during the spring work.

Beside the change in color of the foliage, the trees were practically without the numerous pitch tubes for identification purposes. Pitch tubes were very scarce and on some trees entirely lacking. Only a small amount of fine sawdust clinging to the bark or around the stump was the only means of identification of an infested tree. A thorough cross-examination of each area where control work was attempted was therefore necessary, and a spotter was kept busy locating trees for three or four men who were doing the cutting and peeling.

The same method of treatment was followed in both spring and fall work; i.e., felling the tree, lopping and scattering the brush, and peeling the bark from the infested portion.

A total of 2,713 trees were treated during the fall work with a total expenditure of $4,905, or an average cost per tree of $1.81. 8,632 trees were treated during the spring work, with an average cost of $1.51. These costs include contributed time; i.e., Forest officers' salaries paid from the Forest Service salary fund.

The average D B.H. for spring-treated trees was 11" and for fall-treated trees 11.6". The average length treated for both spring- and fall-treated trees was 22'.

Summary of Cost of Work

Item	Spring	Fall
Examination	$ .018	$ .021
General Supervision	.073	.154
Crew Supervision and Spotting	.259	.527
Labor	.746	.837
Subsistence	.268	.226
Supplies and Equipment	.100	.022
Transportation	.036	.021
Miscellaneous	.008	.000
Total cost per tree	$1.508	$1.808

Total cost calendar year 1927-$17,917.15
Total trees treated - - - - - 11,345
Average cost per tree- - - - - $1.58

Arthur L. Nelson.

METHODS FOR CONTROLLING INSECT PESTS
from SCIENCE, December 2, 1927

The warfare now being waged against forest insects in many parts of the world by means of airplanes that swoop over the trees, scattering clouds of poison dust in their wake, received a dramatic justification in Czecho-Slovakia recently, according to Dr. L.O. Howard, of the U.S. Department of Agriculture.

During his recent European tour Dr. Howard was shown a tract of spruce woods in Czecho-Slovakia. This forest was divided into three parts, one of which was owned by the government, one by a wealthy nobleman and the third by a neighboring city. When it was proposed to dust the forest from an airplane to check the ravages of the destructive nun moth, the government and the owner of the private estate agreed to assume their share of the cost, but the municipality refused to spend the money. The aviator, therefore, dusted the portions of the forest for which protection had been provided, and left the municipal forest untreated.

During the past season the results of the divergent policies became apparent. The government and private parts of the forest were in a thriving and healthy condition, whereas the municipal forest fell a victim to the false economy of the city fathers, and is now practically ruined by the moths. It will have to be cut down and sold for paper pulp at a fraction of its value.

A new style of chemical warfare against insect pests of forest and orchard trees, which may partly or wholly replace the time-honored but expensive methods of spraying and dusting, is described by Dr. Howard. He saw it being tried out during his stay in Europe this summer.

The method was developed by chemical warfare technicians who wished to turn their military talents to use in the arts of peace. The materials used resemble somewhat the "smoke candles" used to generate a smoke screen in war time, except that the fumes given off by these peacetime chemical smudges contain arsenic, the favorite poison for use against chewing insects.

In some places the arsenic smokes are set on the ground at intervals, and in others they are carried through the grove or orchard on long poles by a rank of men. In either case they fill the air with a white fog, which takes about an hour to settle. At the end of that time an examination of the leaves shows that they are covered with a thin deposit of arsenical residue. Results are not all in from the first experiments, but if the new method is effective against the insects its cheapness and quickness of operation will be strong arguments in favor of its general adoption.

HOFER RETIRES

"George Hofer, senior scientific aid, Forest Insect Investigations, Bureau of Entomology, U.S. Department of Agriculture, retired October 1, 1927,,on account of total disability." Short! Does not mean much to millions of people in the United States--neither does George Washington, Abraham Lincoln nor any of our greatest Americans. So far as the world as a whole is concerned, any one man at any one time is a mere incident, or even less. But to those who know us and live with us, for a short period at least, if we play the game of life according to the rules laid down by our contemporaries, we amount to a great deal. And Hofer is one who has played and is playing the great game of life fairly and squarely. No finer valedictory could be said of anyone.

Hofer came to Forest Insect Investigations in what might be said to be the beginning of the mediaeval period of forest entomology on the Pacific Coast. Joining the Northeastern Oregon Control Project in April, 1911, as a "spotter", he showed promise enough to be appointed a regular "agent" on July 1, 1911. As assistant to Edmonston, he cruised and studied forest insect infestations in Oregon, Colorado, Arizona and Utah. Beside the Northeastern Oregon Control Project Hofer worked on the Parker Station in southern Oregon and the Kaibab in northern Arizona. Most of his time, however, was spent in collecting and studying the life histories of forest insects in Colorado and southern Arizona. Many of the records on roundhead borers published by Craighead, and on flathead borers published by Burke, were obtained by Hofer. He published two farmers' bulletins--"The Aspen Borer and How to Control It", by himself, and "Protection of Mesquite Cordwood and Posts from Borers", with F.C. Craighead as joint author.

While Hofer's disability prevents him from taking the strenuous exercise of climbing up and down the canyon walls of northern Arizona, we trust that it will not prevent him from enjoying life on his cactus ranch near Tucson. We understand that a cactus ranch in Arizona is about the same as a poison oak ranch in California--a mighty fine place to live on but a poor place to make a fortune. To live is what we were placed on this earth for, although most of us seem to have dodged the main issue and to be spending most of our time on the side lines.

Anyhow, we join the other members of the Division of Forest Insect Investigations and many friends in wishing Hofer many long and happy years on the cactus ranch near Tucson. H.E.B.

BIG HOLE BASIN PROJECT

Funds have been allotted for the continuation of the Big Hole Basin insect control project during the season of 1928. This project, which will be on a much larger scale than has heretofore been attempted, will be started in the spring as soon as snow conditions will permit.

J.C.E.

WINTER CONTROL WORK ON THE PRESCOTT

The Prescott National Forest is now carrying on an eradication campaign against a Dendroctonus barberi infestation, which suddenly developed a striking tendency to increase during the season of 1927. With an allotment of $2500 it is planned to treat approximately 2400 infested trees upon an area of about one township near the town of Prescott, Arizona. This is the first project undertaken to control a Barberi infestation, and incidentally the first insect control project in District 3.

On a recent inspection trip of thisarea I was thoroughly impressed by the complicated character of the infestation. At least 75% of the overwintering infestation on this area was in yellow pine trees of the older age classes which had been attacked and killed by the southwestern pine beetle, Dendroctonus barberi. The broods of this species were in the young to full grown larvae stages.

A considerable number of these trees had been previously killed in the top by Ips beetles extending their attack downward for 10% to 50% of the tree length. The broods responsible for this initial top-killing had largely emerged.

Overwintering adults of Ips were found in the inner bark of many of the trees infested by D. barberi. These two forms occurred in the same bark areas, but it was evident that Barberi were primarily responsible for the killing of the tree, and that at that time these Ips adults were only taking advantage of a condition created by the more primary barkbeetle. Evidence found in several trees indicated that groups of Ips adults were merely hibernating in the inner bark surface, and that they were not extending egg galleries. It is possible that these old adults will emerge in the spring to start the characteristic group killing of young trees, such as was prevalent in 1927. So far as I know, this point in the life history is undetermined.

Two Dendroctonus species of minor importance, D. approximatus and D. arizonicus, may also be found in the same trees with D. barberi.

During the summer of 1927 groups of young trees from reproduction up to pole sizes were attacked and killed by several species of Ips. Three such groups, the largest containing about 50 trees, were examined on this trip. It was found that D. barberi attacks had occurred in the larger trees of each group, and in a few cases these trees contained stragglers of the Barberi broods. The Ips broods, however, had either emerged or had died out before maturing. It was evident that this type of group killing in second growth subsided in the fall of 1927.

Up to January 16, 1928, a three-man crew has treated 335 trees, averaging 18" D.B.H., and 595 poles, 6" to 11" D.B.H., at a cost of $794.55. During January, two snowstorms have considerably slowed down the work.

J.M.M.

DISTRICT INVESTIGATIVE COMMITTEE

Mr. Evenden attended the annual meeting of the District Investigative Committee, which was held in Missoula, Montana, on January 12, 13 and 14. This was a very interesting and educational meeting, as all phases of forestry were discussed. Mr. Evenden presented the investigative program of the Coeur d'Alene Station, with a brief summary of the results accomplished. J.C.E.

WHY DID MRS. DENDROCTONUS LEAVE HOME?

Is the present restlessness of the growing generation communicating itself even to insects in the wild, snowy and woolly Sapphire Mountains of western Montana, where for years past they have been peacefully pursuing their course south along the Continental Divide, industriously nibbling at the more tender portions of the lodgepole pine? We can hardly believe influence could be so far-reaching, but how else can we account for Mrs. Denny's leaving after she had started a nice little home under the bark, and some of her progeny were already busily constructing little tunnels? Maybe she was descended from one of the early pioneer bugs, and when she found her home being crowded by numerous equally industrious neighbors she, like her ancestors, decided to pull up stakes and depart for the great open places where bugs are bugs. This, of course, may have been a bum steer. Maybe Mr. Denny had decided to spend a night out and had departed when the Missus wasn't looking, only to be followed in a short time by an angry spouse who was still seeking him when we found her deserted home and family. Still again, she may have been one of those high-toned bugs, determined to find a place like the one she had been accustomed to, and had dragged hubby Denny off with her in her quest.

Not improbably there are many like her in the bug community who seek new homes after being once well started, and thereby greatly swell the numbers of late comers who are looking for a home for the first time. A.L.G.

KAIBAB EPIDEMIC IS OVER

Supervisor Mann of the Kaibab Forest reports that the entire yellow pine type has been covered very thoroughly, that he has taken observations with field glasses from all the lookout points, and that he has been unable to find even one tree killed by Dendroctonus ponderosae this year. (District 4 Forest Insect Report)

(Keen estimates the average annual loss from 1919 to 1925 as 100,000 trees.)

WILL DUG OUT ADULTS DIG IN?

In April 1926, before any normal emergence could have occurred, attacks of Dendroctonus monticolae were noted in the top of a felled lodgepole pine. These attacks doubtless came from parent adults liberated by removing bark on the same tree the preceding day. An overwintering adult is not the general rule, but if one will re-attack what might we expect from adults liberated by fall control work? A.L.G.

PREHISTORIC FOREST ENTOMOLOGY - II

Barkbeetles take up so much of our time at present that it is rather surprising to find that the first investigative work done on the Pacific Coast was on species belonging to other orders of insects.

In April 1903 Burke was sent to Grays Harbor, Wash., with orders to study a caterpillar reported to have killed thousands of acres of hemlock and spruce about 1890, in southwestern Washington and northwestern Oregon, and to determine the cause of the black check defect in hemlock lumber reported by E.T. Allen of the Bureau of Forestry in 1900.

Headquarters were established at Hoquiam about April 20, and the field work began.

Surveys were made over most of the Grays Harbor country, and also around Puget Sound and Willapa Harbor. Many old dead hemlock and spruce snags were found that had been killed in the epidemic of 1890, but there was no trace of the insect responsible for the damage. Not until 1919 and 1920 did the pest again become destructive in this area. At this time the species was identified as the hemlock span worm, Therina somniaria Hulst, a species belonging to the order Lepidoptera.

The insect responsible for the black check in hemlock was found during 1903 and its life history studied. It proved to be a maggot belonging to the family Syrphidae of the order Diptera. Members of this family are usually thought of as beneficial to mankind as parasites on plant lice and other similar pests which prey on man's prized plants. Like most families, however, the family Syrphidae has its "black sheep".

Beside the hemlock "bark maggot" a closely related species was found, producing a similar defect in the wood of the grand fir.

While most of the field work of the first year was spent on span worms and bark maggots, other insects were not neglected. Probably the most important of these was a species of bark weevil, afterward proclaimed to science as Pissodes sitchensis Hopk. This was discovered to be killing the tops of numerous young tide-land spruce in the vicinity of Grays Harbor.

All in all, the first year was very profitably spent, and indicated the possibilities and the wealth of scientific material that a continued study of forest insects on the Pacific Coast would bring.

H.E.B.